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ATMOSPHERIC PATHWAY SCREENING ANALYSIS FOR THE E-AREA LOW LEVEL WASTE FACILITY

Kimberly P. Crapse
James R. Cook

SEPTEMBER 5, 2006

Savannah River National Laboratory
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REVIEWS AND APPROVALS

Authors

9/6/06

Kimberly P. Crapse, Environmental Analysis and Performance Modeling **Date**

9/6/06

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Design Check (per Manual E7, Procedure 2.40)

9/6/06

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EXECUTIVE SUMMARY

An atmospheric screening process developed and applied previously to Saltstone Disposal Facility Vault 4 (Crapse and Cook, 2004) has been used to determine a list of radionuclides requiring detailed analysis to derive disposal limits for the E-Area Low Level Waste Facility based on the atmospheric pathway. This sequential screening process uses a methodology developed by the National Council on Radiation Protection and Measurements, professional judgement and process knowledge. Trigger values specific to the E-Area Low Level Waste Facility have been developed for radionuclides of potential interest to the atmospheric pathway. Using this atmospheric screening process, fifteen radionuclides have been determined to require detailed analysis.

DISCUSSION

The National Council on Radiation Protection and Measurements (NCRP) has published a report that described a methodology to screen out, or remove from further consideration, radionuclides for detailed analysis in a performance assessment (NCRP, 1996). The NCRP provides a screening methodology, which uses some conservative assumptions, a few facility-specific parameters and an estimated inventory to produce a dose estimate for each radionuclide. If the estimated dose exceeds the dose criteria, then that radionuclide must undergo further analysis.

This process was implemented for the E-Area Low Level Waste Facility by conservatively assuming an inventory of 10,000,000 curies for each radionuclide and a dose criteria of 0.1 mrem/year. Additionally, the entire E-Area Low Level Waste Facility inventory was assumed to be contained within a single disposal unit. The dimensions of the disposal unit were assumed to be the unit with the smallest footprint, the Intermediate Level Vault. When the process was applied, 10 of the 826 radionuclides considered were removed from further consideration – Ar-37, At-215, Fr-219, Hf-174, Kr-81m, Ne-19, Po-212, Po-213, Po-214 and Rn-218. The screening factors and doses are shown in Table 1.

In order to further reduce the number of radionuclides to be considered in the detailed analysis, some fundamental principles of physics and chemistry were applied. The performance assessment only considers times after final facility closure. Once the disposal units are filled and capped, there are only two possible ways for radionuclides to be released to the atmosphere. One is by particulates produced by intrusion, which will be considered separately in the performance assessment, and the other is by release as a gas. The list of elements comprising the remaining 816 radionuclides was examined to identify those which have the potential to form a vapor phase in the disposal units. This produced the following elements: Ar, As, At, Br, C, Cl, F, Ge, H, Hg, I, Kr, N, O, P, S, Sb, Se, Sn and Xe. Radon was not considered further because it is treated separately in the performance assessment process (USDOE 1999). Excluding the radionuclides removed from consideration by the NCRP screening step, these elements have a total of 139 individual radionuclides. Trigger values were calculated from the screening results for these 139 remaining radionuclides using the methodology developed for E-Area (Cook, 2004).

The current inventory for the E-Area Low Level Waste Facility was determined using the Waste Inventory Tracking System (WITS) database. Of the 139 radionuclides that could exist in the gas phase, 15 are in the inventory at levels above the calculated trigger value: C-14, Cl-36, H-3, I-129, S-35, Sb-124, Sb-125, Se-75, Se-79, Sn-113, Sn-119m, Sn-121, Sn-121m, Sn-123, and Sn-126. A detailed analysis of the atmospheric pathway for these radionuclides will be performed.

Trigger values for the remaining 124 radionuclides are presented in Table 2. If any of the 124 other radionuclides do appear in the waste stream, the quantity can be compared to the Trigger Value. If the estimated total inventory will be less than the Trigger Value, then no further analysis

is needed. If the estimated total inventory exceeds the Trigger Value, a Special Analysis will be required before that waste can be accepted for disposal. The Trigger Values are given in Table 2.

CONCLUSIONS

Fifteen radionuclides have been determined to require detailed analysis for the E-Area Low Level Waste Facility atmospheric pathway. Trigger values have been developed for other radionuclides of potential interest to the E-Area Low Level Waste Facility atmospheric pathway.

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor (Sv/Bq-m^{-3})	Level I Screening Factor (mrem/Ci-m^{-3})	Screening Dose mrem/yr
Ac-223	1.6E-08	5.9E+07	1.2E+03
Ac-224	5.1E-04	1.9E+12	3.8E+07
Ac-225	2.5E-02	9.3E+13	1.9E+09
Ac-226	2.9E-03	1.1E+13	2.2E+08
Ac-227	1.0E+01	3.7E+16	7.5E+11
Ac-228	4.4E-04	1.6E+12	3.3E+07
Ag-102	3.9E-06	1.4E+10	2.9E+05
Ag-103	2.5E-06	9.3E+09	1.9E+05
Ag-104	7.9E-06	2.9E+10	5.9E+05
Ag-104m	3.2E-06	1.2E+10	2.4E+05
Ag-105	1.5E-03	5.6E+12	1.1E+08
Ag-106	1.2E-06	4.4E+09	9.0E+04
Ag-106m	1.8E-03	6.7E+12	1.4E+08
Ag-108	3.0E-09	1.1E+07	2.3E+02
Ag-108m	3.6E-01	1.3E+15	2.7E+10
Ag-109m	1.5E-10	5.6E+05	1.1E+01
Ag-110	3.1E-10	1.1E+06	2.3E+01
Ag-110m	2.8E-02	1.0E+14	2.1E+09
Ag-111	1.0E-03	3.7E+12	7.5E+07
Ag-112	5.1E-06	1.9E+10	3.8E+05
Ag-115	2.4E-06	8.9E+09	1.8E+05
Al-26	5.7E-01	2.1E+15	4.3E+10
Al-28	2.7E-07	1.0E+09	2.0E+04
Am-237	1.4E-06	5.2E+09	1.1E+05
Am-238	5.2E-06	1.9E+10	3.9E+05
Am-239	7.2E-06	2.7E+10	5.4E+05
Am-240	1.2E-04	4.4E+11	9.0E+06
Am-241	1.0E+00	3.7E+15	7.5E+10
Am-242	1.4E-04	5.2E+11	1.1E+07
Am-242m	1.0E+00	3.7E+15	7.5E+10
Am-243	1.1E+00	4.1E+15	8.3E+10
Am-244	5.1E-05	1.9E+11	3.8E+06
Am-244m	1.5E-06	5.6E+09	1.1E+05
Am-245	3.1E-07	1.1E+09	2.3E+04
Am-246	2.1E-06	7.8E+09	1.6E+05
Am-246m	1.7E-06	6.3E+09	1.3E+05
Ar-37	1.7E-12	6.3E+03	1.3E-01
Ar-39	0.0E+00	0.0E+00	0.0E+00
Ar-41	1.5E-06	5.6E+09	1.1E+05
As-69	1.8E-06	6.7E+09	1.4E+05
As-70	1.0E-05	3.7E+10	7.5E+05
As-71	1.1E-04	4.1E+11	8.3E+06
As-72	1.2E-04	4.4E+11	9.0E+06
As-73	3.1E-04	1.1E+12	2.3E+07
As-74	1.4E-03	5.2E+12	1.1E+08

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
As-76	6.2E-05	2.3E+11	4.7E+06
As-77	2.1E-05	7.8E+10	1.6E+06
As-78	4.8E-06	1.8E+10	3.6E+05
At-207	1.6E-05	5.9E+10	1.2E+06
At-211	2.4E-04	8.9E+11	1.8E+07
At-215	5.8E-15	2.1E+01	4.4E-04
At-216	3.1E-12	1.1E+04	2.3E-01
At-217	3.2E-10	1.2E+06	2.4E+01
At-218	2.2E-08	8.1E+07	1.7E+03
Au-193	7.0E-06	2.6E+10	5.3E+05
Au-194	8.2E-05	3.0E+11	6.2E+06
Au-195	9.1E-04	3.4E+12	6.8E+07
Au-195m	4.5E-09	1.7E+07	3.4E+02
Au-198	1.5E-04	5.6E+11	1.1E+07
Au-198m	2.8E-04	1.0E+12	2.1E+07
Au-199	6.9E-05	2.6E+11	5.2E+06
Au-200	8.1E-07	3.0E+09	6.1E+04
Au-200m	8.3E-05	3.1E+11	6.2E+06
Au-201	1.4E-07	5.2E+08	1.1E+04
Ba-126	5.4E-06	2.0E+10	4.1E+05
Ba-128	3.3E-04	1.2E+12	2.5E+07
Ba-131	4.2E-04	1.6E+12	3.2E+07
Ba-131m	4.6E-07	1.7E+09	3.5E+04
Ba-133	4.6E-02	1.7E+14	3.5E+09
Ba-133m	5.2E-05	1.9E+11	3.9E+06
Ba-135m	1.8E-05	6.7E+10	1.4E+06
Ba-137m	1.2E-07	4.4E+08	9.0E+03
Ba-139	4.6E-07	1.7E+09	3.5E+04
Ba-140	2.4E-03	8.9E+12	1.8E+08
Ba-141	1.6E-06	5.9E+09	1.2E+05
Ba-142	1.8E-06	6.7E+09	1.4E+05
Be-7	1.2E-04	4.4E+11	9.0E+06
Be-10	2.6E-03	9.6E+12	2.0E+08
Bi-200	6.6E-06	2.4E+10	5.0E+05
Bi-201	8.4E-06	3.1E+10	6.3E+05
Bi-202	1.0E-05	3.7E+10	7.5E+05
Bi-203	5.7E-05	2.1E+11	4.3E+06
Bi-205	1.3E-03	4.8E+12	9.8E+07
Bi-206	1.2E-03	4.4E+12	9.0E+07
Bi-207	2.7E-01	1.0E+15	2.0E+10
Bi-210	4.5E-03	1.7E+13	3.4E+08
Bi-210m	1.2E-01	4.4E+14	9.0E+09
Bi-211	7.4E-09	2.7E+07	5.6E+02
Bi-212	3.8E-05	1.4E+11	2.9E+06
Bi-213	2.7E-05	1.0E+11	2.0E+06
Bi-214	1.3E-05	4.8E+10	9.8E+05

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Bk-245	1.5E-04	5.6E+11	1.1E+07
Bk-246	9.0E-05	3.3E+11	6.8E+06
Bk-247	1.3E+00	4.8E+15	9.8E+10
Bk-249	3.3E-03	1.2E+13	2.5E+08
Bk-250	2.0E-05	7.4E+10	1.5E+06
Br-74	7.9E-06	2.9E+10	5.9E+05
Br-74m	9.2E-06	3.4E+10	6.9E+05
Br-75	1.2E-05	4.4E+10	9.0E+05
Br-76	8.1E-05	3.0E+11	6.1E+06
Br-77	6.4E-05	2.4E+11	4.8E+06
Br-80	1.5E-07	5.6E+08	1.1E+04
Br-80m	1.6E-06	5.9E+09	1.2E+05
Br-82	2.3E-04	8.5E+11	1.7E+07
Br-83	2.4E-07	8.9E+08	1.8E+04
Br-84	3.6E-06	1.3E+10	2.7E+05
C-11	1.5E-06	5.6E+09	1.1E+05
C-14	2.6E-04	9.6E+11	2.0E+07
Ca-41	2.4E-03	8.9E+12	1.8E+08
Ca-45	1.0E-03	3.7E+12	7.5E+07
Ca-47	7.3E-04	2.7E+12	5.5E+07
Ca-49	3.0E-06	1.1E+10	2.3E+05
Cd-104	4.9E-06	1.8E+10	3.7E+05
Cd-107	6.1E-07	2.3E+09	4.6E+04
Cd-109	2.8E-03	1.0E+13	2.1E+08
Cd-113	1.5E-01	5.6E+14	1.1E+10
Cd-113m	8.3E-02	3.1E+14	6.2E+09
Cd-115	2.0E-04	7.4E+11	1.5E+07
Cd-115m	2.8E-03	1.0E+13	2.1E+08
Cd-117	4.1E-05	1.5E+11	3.1E+06
Cd-117m	1.7E-05	6.3E+10	1.3E+06
Ce-134	3.6E-04	1.3E+12	2.7E+07
Ce-135	6.5E-05	2.4E+11	4.9E+06
Ce-137	6.6E-07	2.4E+09	5.0E+04
Ce-137m	3.0E-05	1.1E+11	2.3E+06
Ce-139	1.0E-03	3.7E+12	7.5E+07
Ce-141	5.0E-04	1.9E+12	3.8E+07
Ce-143	1.1E-04	4.1E+11	8.3E+06
Ce-144	5.2E-03	1.9E+13	3.9E+08
Cf-244	2.0E-05	7.4E+10	1.5E+06
Cf-246	1.5E-03	5.6E+12	1.1E+08
Cf-248	1.3E-01	4.8E+14	9.8E+09
Cf-249	1.3E+00	4.8E+15	9.8E+10
Cf-250	5.7E-01	2.1E+15	4.3E+10
Cf-251	1.3E+00	4.8E+15	9.8E+10
Cf-252	4.1E-01	1.5E+15	3.1E+10
Cf-253	8.5E-03	3.1E+13	6.4E+08

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Cf-254	8.7E-01	3.2E+15	6.5E+10
Cl-36	6.5E-01	2.4E+15	4.9E+10
Cl-38	3.3E-06	1.2E+10	2.5E+05
Cl-39	3.8E-06	1.4E+10	2.9E+05
Cm-238	1.6E-05	5.9E+10	1.2E+06
Cm-240	1.9E-02	7.0E+13	1.4E+09
Cm-241	1.4E-03	5.2E+12	1.1E+08
Cm-242	4.0E-02	1.5E+14	3.0E+09
Cm-243	7.1E-01	2.6E+15	5.3E+10
Cm-244	5.4E-01	2.0E+15	4.1E+10
Cm-245	1.1E+00	4.1E+15	8.3E+10
Cm-246	1.1E+00	4.1E+15	8.3E+10
Cm-247	1.1E+00	4.1E+15	8.3E+10
Cm-248	3.9E+00	1.4E+16	2.9E+11
Cm-249	5.5E-07	2.0E+09	4.1E+04
Cm-250	2.2E+01	8.1E+16	1.7E+12
Co-55	7.5E-05	2.8E+11	5.6E+06
Co-56	1.6E-02	5.9E+13	1.2E+09
Co-57	2.1E-03	7.8E+12	1.6E+08
Co-58	4.2E-03	1.6E+13	3.2E+08
Co-58m	2.2E-05	8.1E+10	1.7E+06
Co-60	1.7E-01	6.3E+14	1.3E+10
Co-60m	6.4E-07	2.4E+09	4.8E+04
Co-61	5.6E-07	2.1E+09	4.2E+04
Co-62m	3.3E-06	1.2E+10	2.5E+05
Cr-48	1.8E-04	6.7E+11	1.4E+07
Cr-49	2.3E-06	8.5E+09	1.7E+05
Cr-51	9.2E-05	3.4E+11	6.9E+06
Cs-125	2.7E-05	1.0E+11	2.0E+06
Cs-126	8.8E-08	3.3E+08	6.6E+03
Cs-127	7.5E-06	2.8E+10	5.6E+05
Cs-128	3.5E-07	1.3E+09	2.6E+04
Cs-129	2.1E-05	7.8E+10	1.6E+06
Cs-130	9.8E-07	3.6E+09	7.4E+04
Cs-131	1.1E-04	4.1E+11	8.3E+06
Cs-132	7.0E-04	2.6E+12	5.3E+07
Cs-134	1.3E-01	4.8E+14	9.8E+09
Cs-134m	2.1E-05	7.8E+10	1.6E+06
Cs-135	2.0E-02	7.4E+13	1.5E+09
Cs-135m	4.0E-06	1.5E+10	3.0E+05
Cs-136	6.7E-03	2.5E+13	5.0E+08
Cs-137	2.2E-01	8.1E+14	1.7E+10
Cs-138	4.5E-06	1.7E+10	3.4E+05
Cu-60	6.3E-06	2.3E+10	4.7E+05
Cu-61	5.7E-06	2.1E+10	4.3E+05
Cu-62	9.3E-07	3.4E+09	7.0E+04

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Cu-64	5.2E-06	1.9E+10	3.9E+05
Cu-66	4.6E-08	1.7E+08	3.5E+03
Cu-67	6.3E-05	2.3E+11	4.7E+06
Dy-155	1.6E-05	5.9E+10	1.2E+06
Dy-157	5.2E-06	1.9E+10	3.9E+05
Dy-159	3.2E-04	1.2E+12	2.4E+07
Dy-165	3.9E-07	1.4E+09	2.9E+04
Dy-166	3.6E-04	1.3E+12	2.7E+07
Er-161	6.1E-06	2.3E+10	4.6E+05
Er-165	8.4E-07	3.1E+09	6.3E+04
Er-169	1.3E-04	4.8E+11	9.8E+06
Er-171	6.7E-06	2.5E+10	5.0E+05
Er-172	2.6E-04	9.6E+11	2.0E+07
Es-250	1.1E-05	4.1E+10	8.3E+05
Es-251	2.2E-05	8.1E+10	1.7E+06
Es-253	1.0E-02	3.7E+13	7.5E+08
Es-254	9.4E-02	3.5E+14	7.1E+09
Es-254m	1.4E-03	5.2E+12	1.1E+08
Eu-145	4.6E-04	1.7E+12	3.5E+07
Eu-146	6.0E-04	2.2E+12	4.5E+07
Eu-147	6.6E-04	2.4E+12	5.0E+07
Eu-148	3.4E-02	1.3E+14	2.6E+09
Eu-149	3.0E-04	1.1E+12	2.3E+07
Eu-150a	4.4E-06	1.6E+10	3.3E+05
Eu-150b	2.8E-01	1.0E+15	2.1E+10
Eu-152	1.4E-01	5.2E+14	1.1E+10
Eu-152m	7.6E-06	2.8E+10	5.7E+05
Eu-154	1.2E-01	4.4E+14	9.0E+09
Eu-155	4.7E-03	1.7E+13	3.5E+08
Eu-156	1.6E-03	5.9E+12	1.2E+08
Eu-157	1.4E-05	5.2E+10	1.1E+06
Eu-158	2.6E-06	9.6E+09	2.0E+05
F-18	4.1E-06	1.5E+10	3.1E+05
Fe-52	4.8E-05	1.8E+11	3.6E+06
Fe-55	2.8E-04	1.0E+12	2.1E+07
Fe-59	4.3E-03	1.6E+13	3.2E+08
Fe-60	5.0E-01	1.9E+15	3.8E+10
Fm-252	9.1E-04	3.4E+12	6.8E+07
Fm-253	1.5E-03	5.6E+12	1.1E+08
Fm-254	1.2E-04	4.4E+11	9.0E+06
Fm-255	5.9E-04	2.2E+12	4.4E+07
Fm-257	5.1E-02	1.9E+14	3.8E+09
Fr-219	1.2E-12	4.4E+03	9.0E-02
Fr-220	2.9E-07	1.1E+09	2.2E+04
Fr-221	2.1E-06	7.8E+09	1.6E+05
Fr-222	1.9E-05	7.0E+10	1.4E+06

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Fr-223	6.8E-05	2.5E+11	5.1E+06
Ga-65	2.7E-06	1.0E+10	2.0E+05
Ga-66	4.2E-05	1.6E+11	3.2E+06
Ga-67	3.9E-05	1.4E+11	2.9E+06
Ga-68	3.0E-06	1.1E+10	2.3E+05
Ga-70	6.9E-08	2.6E+08	5.2E+03
Ga-72	6.9E-05	2.6E+11	5.2E+06
Ga-73	3.7E-06	1.4E+10	2.8E+05
Gd-145	4.9E-06	1.8E+10	3.7E+05
Gd-146	5.9E-03	2.2E+13	4.4E+08
Gd-147	1.5E-04	5.6E+11	1.1E+07
Gd-148	4.4E-01	1.6E+15	3.3E+10
Gd-149	3.2E-04	1.2E+12	2.4E+07
Gd-151	4.5E-04	1.7E+12	3.4E+07
Gd-152	3.2E-01	1.2E+15	2.4E+10
Gd-153	1.3E-03	4.8E+12	9.8E+07
Gd-159	1.0E-05	3.7E+10	7.5E+05
Ge-66	1.2E-05	4.4E+10	9.0E+05
Ge-67	2.2E-06	8.1E+09	1.7E+05
Ge-68	1.3E-02	4.8E+13	9.8E+08
Ge-69	7.2E-05	2.7E+11	5.4E+06
Ge-71	1.1E-05	4.1E+10	8.3E+05
Ge-75	2.7E-07	1.0E+09	2.0E+04
Ge-77	2.8E-05	1.0E+11	2.1E+06
Ge-78	4.3E-06	1.6E+10	3.2E+05
H-3	1.9E-06	7.0E+09	1.4E+05
Hf-170	9.4E-05	3.5E+11	7.1E+06
Hf-172	4.9E-02	1.8E+14	3.7E+09
Hf-173	2.8E-05	1.0E+11	2.1E+06
Hf-174	0.0E+00	0.0E+00	0.0E+00
Hf-175	1.2E-03	4.4E+12	9.0E+07
Hf-177m	5.8E-06	2.1E+10	4.4E+05
Hf-178m	4.5E-01	1.7E+15	3.4E+10
Hf-179m	1.5E-03	5.6E+12	1.1E+08
Hf-180m	1.1E-05	4.1E+10	8.3E+05
Hf-181	1.5E-03	5.6E+12	1.1E+08
Hf-182	3.5E-01	1.3E+15	2.6E+10
Hf-182m	3.9E-06	1.4E+10	2.9E+05
Hf-183	4.8E-06	1.8E+10	3.6E+05
Hf-184	1.5E-05	5.6E+10	1.1E+06
Hg-193	3.1E-06	1.1E+10	2.3E+05
Hg-193m	2.7E-05	1.0E+11	2.0E+06
Hg-194	4.7E-01	1.7E+15	3.5E+10
Hg-195	6.1E-06	2.3E+10	4.6E+05
Hg-195m	6.9E-05	2.6E+11	5.2E+06
Hg-197	3.7E-05	1.4E+11	2.8E+06

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Hg-197m	3.0E-05	1.1E+11	2.3E+06
Hg-199m	5.5E-07	2.0E+09	4.1E+04
Hg-203	1.8E-03	6.7E+12	1.4E+08
Ho-155	2.2E-06	8.1E+09	1.7E+05
Ho-157	6.8E-07	2.5E+09	5.1E+04
Ho-159	7.7E-07	2.9E+09	5.8E+04
Ho-161	3.4E-07	1.3E+09	2.6E+04
Ho-162	2.0E-07	7.4E+08	1.5E+04
Ho-162m	1.9E-06	7.0E+09	1.4E+05
Ho-164	6.4E-08	2.4E+08	4.8E+03
Ho-164m	1.6E-07	5.9E+08	1.2E+04
Ho-166	4.7E-05	1.7E+11	3.5E+06
Ho-166m	3.8E-01	1.4E+15	2.9E+10
Ho-167	2.5E-06	9.3E+09	1.9E+05
I-120	9.9E-06	3.7E+10	7.4E+05
I-120m	1.4E-05	5.2E+10	1.1E+06
I-121	5.1E-06	1.9E+10	3.8E+05
I-122	3.3E-07	1.2E+09	2.5E+04
I-123	7.6E-06	2.8E+10	5.7E+05
I-124	8.4E-03	3.1E+13	6.3E+08
I-125	5.2E-02	1.9E+14	3.9E+09
I-126	5.5E-02	2.0E+14	4.1E+09
I-128	2.2E-07	8.1E+08	1.7E+04
I-129	5.6E-01	2.1E+15	4.2E+10
I-130	7.1E-05	2.6E+11	5.3E+06
I-131	2.8E-02	1.0E+14	2.1E+09
I-132	1.2E-05	4.4E+10	9.0E+05
I-132m	6.2E-06	2.3E+10	4.7E+05
I-133	2.2E-04	8.1E+11	1.7E+07
I-134	6.6E-06	2.4E+10	5.0E+05
I-135	2.5E-05	9.3E+10	1.9E+06
In-109	6.3E-06	2.3E+10	4.7E+05
In-110a	4.8E-06	1.8E+10	3.6E+05
In-110b	2.7E-05	1.0E+11	2.0E+06
In-111	7.6E-05	2.8E+11	5.7E+06
In-112	3.3E-07	1.2E+09	2.5E+04
In-113m	1.0E-06	3.7E+09	7.5E+04
In-114	1.3E-09	4.8E+06	9.8E+01
In-114m	3.6E-03	1.3E+13	2.7E+08
In-115	4.0E-02	1.5E+14	3.0E+09
In-115m	1.6E-06	5.9E+09	1.2E+05
In-116m	6.1E-06	2.3E+10	4.6E+05
In-117	1.6E-06	5.9E+09	1.2E+05
In-117m	3.0E-05	1.1E+11	2.3E+06
In-119	1.4E-07	5.2E+08	1.1E+04
In-119m	1.2E-07	4.4E+08	9.0E+03

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Ir-182	2.5E-06	9.3E+09	1.9E+05
Ir-184	1.1E-05	4.1E+10	8.3E+05
Ir-185	3.3E-05	1.2E+11	2.5E+06
Ir-186a	4.8E-05	1.8E+11	3.6E+06
Ir-186b	3.8E-06	1.4E+10	2.9E+05
Ir-187	7.3E-06	2.7E+10	5.5E+05
Ir-188	1.3E-04	4.8E+11	9.8E+06
Ir-189	1.5E-04	5.6E+11	1.1E+07
Ir-190	1.1E-03	4.1E+12	8.3E+07
Ir-190m	4.4E-06	1.6E+10	3.3E+05
Ir-190n	8.7E-07	3.2E+09	6.5E+04
Ir-191m	1.8E-10	6.7E+05	1.4E+01
Ir-192	3.3E-03	1.2E+13	2.5E+08
Ir-192m	2.4E-01	8.9E+14	1.8E+10
Ir-194	2.8E-05	1.0E+11	2.1E+06
Ir-194m	1.6E-02	5.9E+13	1.2E+09
Ir-195	5.9E-07	2.2E+09	4.4E+04
Ir-195m	3.6E-06	1.3E+10	2.7E+05
K-38	2.7E-06	1.0E+10	2.0E+05
K-40	9.4E-02	3.5E+14	7.1E+09
K-42	1.1E-05	4.1E+10	8.3E+05
K-43	4.5E-05	1.7E+11	3.4E+06
K-44	3.7E-06	1.4E+10	2.8E+05
K-45	3.0E-06	1.1E+10	2.3E+05
Kr-74	3.2E-06	1.2E+10	2.4E+05
Kr-76	6.8E-05	2.5E+11	5.1E+06
Kr-77	2.7E-06	1.0E+10	2.0E+05
Kr-79	3.1E-07	1.1E+09	2.3E+04
Kr-81	1.3E-08	4.8E+07	9.8E+02
Kr-81m	4.4E-19	1.6E-03	3.3E-08
Kr-83m	1.1E-10	4.1E+05	8.3E+00
Kr-85	2.8E-09	1.0E+07	2.1E+02
Kr-85m	2.0E-07	7.4E+08	1.5E+04
Kr-87	1.0E-06	3.7E+09	7.5E+04
Kr-88	5.4E-06	2.0E+10	4.1E+05
La-131	3.3E-06	1.2E+10	2.5E+05
La-132	1.8E-05	6.7E+10	1.4E+06
La-134	4.8E-07	1.8E+09	3.6E+04
La-135	1.7E-06	6.3E+09	1.3E+05
La-137	6.2E-03	2.3E+13	4.7E+08
La-138	2.7E-01	1.0E+15	2.0E+10
La-140	2.4E-04	8.9E+11	1.8E+07
La-141	3.8E-06	1.4E+10	2.9E+05
La-142	9.8E-06	3.6E+10	7.4E+05
La-143	9.6E-07	3.6E+09	7.2E+04
Lu-169	1.1E-04	4.1E+11	8.3E+06

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Lu-170	2.3E-04	8.5E+11	1.7E+07
Lu-171	3.9E-04	1.4E+12	2.9E+07
Lu-172	7.3E-04	2.7E+12	5.5E+07
Lu-173	2.8E-03	1.0E+13	2.1E+08
Lu-174	5.6E-03	2.1E+13	4.2E+08
Lu-174m	1.4E-03	5.2E+12	1.1E+08
Lu-176	1.3E-01	4.8E+14	9.8E+09
Lu-176m	6.4E-07	2.4E+09	4.8E+04
Lu-177	1.5E-04	5.6E+11	1.1E+07
Lu-177m	7.8E-03	2.9E+13	5.9E+08
Lu-178	3.2E-07	1.2E+09	2.4E+04
Lu-178m	1.8E-06	6.7E+09	1.4E+05
Lu-179	9.8E-07	3.6E+09	7.4E+04
Md-257	9.5E-05	3.5E+11	7.1E+06
Md-258	3.5E-02	1.3E+14	2.6E+09
Mg-28	1.8E-04	6.7E+11	1.4E+07
Mn-51	2.6E-06	9.6E+09	2.0E+05
Mn-52	9.6E-04	3.6E+12	7.2E+07
Mn-52m	3.7E-06	1.4E+10	2.8E+05
Mn-53	1.8E-04	6.7E+11	1.4E+07
Mn-54	9.7E-03	3.6E+13	7.3E+08
Mn-56	9.1E-06	3.4E+10	6.8E+05
Mo-101	2.2E-06	8.1E+09	1.7E+05
Mo-90	4.7E-05	1.7E+11	3.5E+06
Mo-93	2.1E-03	7.8E+12	1.6E+08
Mo-93m	2.5E-05	9.3E+10	1.9E+06
Mo-99	2.3E-04	8.5E+11	1.7E+07
N-13	9.7E-07	3.6E+09	7.3E+04
Na-22	1.0E-01	3.7E+14	7.5E+09
Na-24	1.1E-04	4.1E+11	8.3E+06
Nb-88	6.1E-06	2.3E+10	4.6E+05
Nb-89a	7.2E-06	2.7E+10	5.4E+05
Nb-89b	1.5E-05	5.6E+10	1.1E+06
Nb-90	1.0E-04	3.7E+11	7.5E+06
Nb-93m	3.2E-04	1.2E+12	2.4E+07
Nb-94	3.8E-01	1.4E+15	2.9E+10
Nb-95	1.2E-03	4.4E+12	9.0E+07
Nb-95m	2.1E-04	7.8E+11	1.6E+07
Nb-96	1.1E-04	4.1E+11	8.3E+06
Nb-97	2.1E-06	7.8E+09	1.6E+05
Nb-97m	5.1E-08	1.9E+08	3.8E+03
Nb-98	6.1E-06	2.3E+10	4.6E+05
Nd-136	4.5E-06	1.7E+10	3.4E+05
Nd-138	9.9E-06	3.7E+10	7.4E+05
Nd-139	1.0E-06	3.7E+09	7.5E+04
Nd-139m	1.9E-05	7.0E+10	1.4E+06

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Nd-141	3.8E-07	1.4E+09	2.9E+04
Nd-141m	2.7E-08	1.0E+08	2.0E+03
Nd-147	4.7E-04	1.7E+12	3.5E+07
Nd-149	4.4E-06	1.6E+10	3.3E+05
Nd-151	1.4E-06	5.2E+09	1.1E+05
Ne-19	2.3E-15	8.5E+00	1.7E-04
Ni-56	2.5E-03	9.3E+12	1.9E+08
Ni-57	3.1E-04	1.1E+12	2.3E+07
Ni-59	6.8E-04	2.5E+12	5.1E+07
Ni-63	1.6E-03	5.9E+12	1.2E+08
Ni-65	3.3E-06	1.2E+10	2.5E+05
Ni-66	1.6E-03	5.9E+12	1.2E+08
Np-232	2.8E-06	1.0E+10	2.1E+05
Np-233	1.9E-07	7.0E+08	1.4E+04
Np-234	3.0E-04	1.1E+12	2.3E+07
Np-235	1.2E-04	4.4E+11	9.0E+06
Np-236a	3.8E+03	1.4E+19	2.9E+14
Np-236b	2.3E-04	8.5E+11	1.7E+07
Np-237	1.3E+00	4.8E+15	9.8E+10
Np-238	1.7E-04	6.3E+11	1.3E+07
Np-239	8.5E-05	3.1E+11	6.4E+06
Np-240	3.4E-06	1.3E+10	2.6E+05
Np-240m	2.6E-07	9.6E+08	2.0E+04
O-15	1.3E-07	4.8E+08	9.8E+03
Os-180	1.9E-06	7.0E+09	1.4E+05
Os-181	7.9E-06	2.9E+10	5.9E+05
Os-182	6.9E-05	2.6E+11	5.2E+06
Os-185	2.8E-03	1.0E+13	2.1E+08
Os-189m	7.3E-08	2.7E+08	5.5E+03
Os-190m	1.5E-06	5.6E+09	1.1E+05
Os-191	3.1E-04	1.1E+12	2.3E+07
Os-191m	1.2E-05	4.4E+10	9.0E+05
Os-193	3.5E-05	1.3E+11	2.6E+06
Os-194	1.2E-02	4.4E+13	9.0E+08
P-30	1.9E-07	7.0E+08	1.4E+04
P-32	7.3E-03	2.7E+13	5.5E+08
P-33	9.8E-04	3.6E+12	7.4E+07
Pa-227	9.8E-05	3.6E+11	7.4E+06
Pa-228	1.1E-03	4.1E+12	8.3E+07
Pa-230	5.4E-03	2.0E+13	4.1E+08
Pa-231	3.0E+00	1.1E+16	2.3E+11
Pa-232	2.0E-04	7.4E+11	1.5E+07
Pa-233	6.7E-04	2.5E+12	5.0E+07
Pa-234	2.5E-05	9.3E+10	1.9E+06
Pa-234m	5.3E-10	2.0E+06	4.0E+01

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Pb-195m	2.9E-06	1.1E+10	2.2E+05
Pb-198	9.3E-06	3.4E+10	7.0E+05
Pb-199	5.8E-06	2.1E+10	4.4E+05
Pb-200	6.2E-05	2.3E+11	4.7E+06
Pb-201	1.6E-05	5.9E+10	1.2E+06
Pb-202	1.3E-01	4.8E+14	9.8E+09
Pb-202m	1.5E-05	5.6E+10	1.1E+06
Pb-203	4.4E-05	1.6E+11	3.3E+06
Pb-205	5.0E-04	1.9E+12	3.8E+07
Pb-209	1.8E-07	6.7E+08	1.4E+04
Pb-210	7.1E-01	2.6E+15	5.3E+10
Pb-211	1.6E-05	5.9E+10	1.2E+06
Pb-212	3.4E-04	1.3E+12	2.6E+07
Pb-214	2.0E-05	7.4E+10	1.5E+06
Pd-100	5.2E-04	1.9E+12	3.9E+07
Pd-101	1.2E-05	4.4E+10	9.0E+05
Pd-103	9.3E-05	3.4E+11	7.0E+06
Pd-107	1.3E-04	4.8E+11	9.8E+06
Pd-109	6.1E-06	2.3E+10	4.6E+05
Pm-141	1.2E-06	4.4E+09	9.0E+04
Pm-142	1.5E-08	5.6E+07	1.1E+03
Pm-143	3.1E-03	1.1E+13	2.3E+08
Pm-144	2.1E-02	7.8E+13	1.6E+09
Pm-145	4.4E-03	1.6E+13	3.3E+08
Pm-146	5.1E-02	1.9E+14	3.8E+09
Pm-147	3.2E-04	1.2E+12	2.4E+07
Pm-148	6.8E-04	2.5E+12	5.1E+07
Pm-148m	4.1E-03	1.5E+13	3.1E+08
Pm-149	8.3E-05	3.1E+11	6.2E+06
Pm-150	8.1E-06	3.0E+10	6.1E+05
Pm-151	4.1E-05	1.5E+11	3.1E+06
Po-203	6.2E-06	2.3E+10	4.7E+05
Po-205	1.3E-05	4.8E+10	9.8E+05
Po-207	1.9E-05	7.0E+10	1.4E+06
Po-210	1.6E-01	5.9E+14	1.2E+10
Po-211	1.7E-12	6.3E+03	1.3E-01
Po-212	0.0E+00	0.0E+00	0.0E+00
Po-213	6.4E-17	2.4E-01	4.8E-06
Po-214	5.7E-18	2.1E-02	4.3E-07
Po-215	1.3E-11	4.8E+04	9.8E-01
Po-216	1.3E-09	4.8E+06	9.8E+01
Po-218	2.0E-06	7.4E+09	1.5E+05
Pr-136	2.5E-06	9.3E+09	1.9E+05
Pr-137	1.7E-06	6.3E+09	1.3E+05
Pr-138	4.9E-08	1.8E+08	3.7E+03
Pr-138m	1.1E-05	4.1E+10	8.3E+05

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Pr-139	2.5E-06	9.3E+09	1.9E+05
Pr-142	2.7E-05	1.0E+11	2.0E+06
Pr-142m	3.5E-07	1.3E+09	2.6E+04
Pr-143	5.2E-04	1.9E+12	3.9E+07
Pr-144	1.1E-07	4.1E+08	8.3E+03
Pr-144m	3.7E-08	1.4E+08	2.8E+03
Pr-145	1.7E-06	6.3E+09	1.3E+05
Pr-147	1.4E-06	5.2E+09	1.1E+05
Pt-186	6.4E-06	2.4E+10	4.8E+05
Pt-188	9.6E-04	3.6E+12	7.2E+07
Pt-189	1.2E-05	4.4E+10	9.0E+05
Pt-191	6.4E-05	2.4E+11	4.8E+06
Pt-193	1.7E-04	6.3E+11	1.3E+07
Pt-193m	7.6E-05	2.8E+11	5.7E+06
Pt-195m	1.1E-04	4.1E+11	8.3E+06
Pt-197	7.3E-06	2.7E+10	5.5E+05
Pt-197m	1.0E-06	3.7E+09	7.5E+04
Pt-199	9.1E-07	3.4E+09	6.8E+04
Pt-200	1.6E-05	5.9E+10	1.2E+06
Pu-234	1.2E-04	4.4E+11	9.0E+06
Pu-235	1.6E-07	5.9E+08	1.2E+04
Pu-236	3.5E-01	1.3E+15	2.6E+10
Pu-237	1.6E-04	5.9E+11	1.2E+07
Pu-238	8.9E-01	3.3E+15	6.7E+10
Pu-239	1.0E+00	3.7E+15	7.5E+10
Pu-240	1.0E+00	3.7E+15	7.5E+10
Pu-241	2.0E-02	7.4E+13	1.5E+09
Pu-242	9.5E-01	3.5E+15	7.1E+10
Pu-243	6.2E-07	2.3E+09	4.7E+04
Pu-244	1.0E+00	3.7E+15	7.5E+10
Pu-245	1.3E-05	4.8E+10	9.8E+05
Pu-246	1.5E-03	5.6E+12	1.1E+08
Ra-222	4.7E-08	1.7E+08	3.5E+03
Ra-223	5.6E-02	2.1E+14	4.2E+09
Ra-224	1.6E-02	5.9E+13	1.2E+09
Ra-225	4.7E-02	1.7E+14	3.5E+09
Ra-226	8.3E-01	3.1E+15	6.2E+10
Ra-227	1.1E-05	4.1E+10	8.3E+05
Ra-228	4.2E-01	1.6E+15	3.2E+10
Rb-79	2.4E-06	8.9E+09	1.8E+05
Rb-80	1.8E-08	6.7E+07	1.4E+03
Rb-81	5.4E-06	2.0E+10	4.1E+05
Rb-81m	5.7E-07	2.1E+09	4.3E+04
Rb-82	5.3E-08	2.0E+08	4.0E+03
Rb-82m	3.1E-05	1.1E+11	2.3E+06
Rb-83	7.5E-03	2.8E+13	5.6E+08

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Rb-84	7.3E-03	2.7E+13	5.5E+08
Rb-86	4.8E-03	1.8E+13	3.6E+08
Rb-87	1.6E-02	5.9E+13	1.2E+09
Rb-88	1.0E-06	3.7E+09	7.5E+04
Rb-89	3.4E-06	1.3E+10	2.6E+05
Re-177	1.2E-06	4.4E+09	9.0E+04
Re-178	1.7E-06	6.3E+09	1.3E+05
Re-180	2.2E-07	8.1E+08	1.7E+04
Re-181	3.6E-05	1.3E+11	2.7E+06
Re-182a	2.5E-05	9.3E+10	1.9E+06
Re-182b	2.8E-04	1.0E+12	2.1E+07
Re-184	1.9E-03	7.0E+12	1.4E+08
Re-184m	7.9E-03	2.9E+13	5.9E+08
Re-186	2.4E-04	8.9E+11	1.8E+07
Re-186m	2.1E-02	7.8E+13	1.6E+09
Re-187	1.8E-05	6.7E+10	1.4E+06
Re-188	2.3E-05	8.5E+10	1.7E+06
Re-188m	5.4E-07	2.0E+09	4.1E+04
Re-189	2.4E-05	8.9E+10	1.8E+06
Rh-99	9.8E-05	3.6E+11	7.4E+06
Rh-99m	1.3E-02	4.8E+13	9.8E+08
Rh-100	9.1E-05	3.4E+11	6.8E+06
Rh-101	8.0E-02	3.0E+14	6.0E+09
Rh-101m	5.5E-03	2.0E+13	4.1E+08
Rh-102	1.2E-08	4.4E+07	9.0E+02
Rh-102m	2.4E-05	8.9E+10	1.8E+06
Rh-103m	2.7E-09	1.0E+07	2.0E+02
Rh-105	1.3E-05	4.8E+10	9.8E+05
Rh-106	5.2E-07	1.9E+09	3.9E+04
Rh-106m	5.9E-04	2.2E+12	4.4E+07
Rh-107	5.9E-06	2.2E+10	4.4E+05
Rn-218	1.2E-15	4.4E+00	9.0E-05
Rn-219	2.9E-08	1.1E+08	2.2E+03
Rn-220	5.0E-07	1.9E+09	3.8E+04
Rn-222	5.5E-04	2.0E+12	4.1E+07
Ru-103	1.1E-03	4.1E+12	8.3E+07
Ru-94	1.0E-05	3.7E+10	7.5E+05
Ru-97	9.6E-03	3.6E+13	7.2E+08
Ru-105	4.2E-06	1.6E+10	3.2E+05
Ru-106	4.1E-05	1.5E+11	3.1E+06
S-35	3.0E-03	1.1E+13	2.3E+08
Sb-115	1.7E-06	6.3E+09	1.3E+05
Sb-116	2.8E-06	1.0E+10	2.1E+05
Sb-116m	8.5E-06	3.1E+10	6.4E+05
Sb-117	1.1E-06	4.1E+09	8.3E+04
Sb-118m	2.2E-05	8.1E+10	1.7E+06

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Sb-119	5.6E-06	2.1E+10	4.2E+05
Sb-120a	5.9E-07	2.2E+09	4.4E+04
Sb-120b	7.2E-04	2.7E+12	5.4E+07
Sb-122	2.3E-04	8.5E+11	1.7E+07
Sb-124	5.3E-03	2.0E+13	4.0E+08
Sb-124m	1.0E-07	3.7E+08	7.5E+03
Sb-124n	1.6E-06	5.9E+09	1.2E+05
Sb-125	1.6E-02	5.9E+13	1.2E+09
Sb-126	2.1E-03	7.8E+12	1.6E+08
Sb-126m	2.6E-06	9.6E+09	2.0E+05
Sb-127	3.7E-04	1.4E+12	2.8E+07
Sb-128a	2.0E-06	7.4E+09	1.5E+05
Sb-128b	5.3E-05	2.0E+11	4.0E+06
Sb-129	1.5E-05	5.6E+10	1.1E+06
Sb-130	7.1E-06	2.6E+10	5.3E+05
Sb-131	5.9E-05	2.2E+11	4.4E+06
Sc-43	8.5E-06	3.1E+10	6.4E+05
Sc-44	1.5E-05	5.6E+10	1.1E+06
Sc-44m	4.2E-04	1.6E+12	3.2E+07
Sc-46	6.6E-03	2.4E+13	5.0E+08
Sc-47	8.8E-05	3.3E+11	6.6E+06
Sc-48	3.0E-04	1.1E+12	2.3E+07
Sc-49	2.0E-07	7.4E+08	1.5E+04
Se-70	7.1E-06	2.6E+10	5.3E+05
Se-73	1.6E-05	5.9E+10	1.2E+06
Se-73m	1.6E-06	5.9E+09	1.2E+05
Se-75	1.4E-02	5.2E+13	1.1E+09
Se-77m	7.1E-10	2.6E+06	5.3E+01
Se-79	1.7E-02	6.3E+13	1.3E+09
Se-81	5.9E-08	2.2E+08	4.4E+03
Se-81m	2.6E-07	9.6E+08	2.0E+04
Se-83	3.9E-06	1.4E+10	2.9E+05
Si-31	4.4E-07	1.6E+09	3.3E+04
Si-32	6.8E-02	2.5E+14	5.1E+09
Sm-141	1.8E-06	6.7E+09	1.4E+05
Sm-141m	3.9E-06	1.4E+10	2.9E+05
Sm-142	3.3E-06	1.2E+10	2.5E+05
Sm-145	1.2E-03	4.4E+12	9.0E+07
Sm-146	1.4E-01	5.2E+14	1.1E+10
Sm-147	1.3E-01	4.8E+14	9.8E+09
Sm-151	1.6E-04	5.9E+11	1.2E+07
Sm-153	5.6E-05	2.1E+11	4.2E+06
Sm-155	2.5E-07	9.3E+08	1.9E+04
Sm-156	4.5E-05	1.7E+11	3.4E+06
Sn-110	1.3E-05	4.8E+10	9.8E+05
Sn-111	1.7E-06	6.3E+09	1.3E+05

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Sn-113	2.3E-03	8.5E+12	1.7E+08
Sn-117m	6.1E-04	2.3E+12	4.6E+07
Sn-119m	6.7E-04	2.5E+12	5.0E+07
Sn-121	8.9E-06	3.3E+10	6.7E+05
Sn-121m	3.7E-03	1.4E+13	2.8E+08
Sn-123	3.4E-03	1.3E+13	2.6E+08
Sn-123m	4.0E-07	1.5E+09	3.0E+04
Sn-125	2.1E-03	7.8E+12	1.6E+08
Sn-126	5.2E-01	1.9E+15	3.9E+10
Sn-127	1.7E-05	6.3E+10	1.3E+06
Sn-128	6.2E-06	2.3E+10	4.7E+05
Sr-80	5.7E-06	2.1E+10	4.3E+05
Sr-81	2.9E-06	1.1E+10	2.2E+05
Sr-82	8.4E-03	3.1E+13	6.3E+08
Sr-83	1.8E-04	6.7E+11	1.4E+07
Sr-85	1.8E-03	6.7E+12	1.4E+08
Sr-85m	1.8E-06	6.7E+09	1.4E+05
Sr-87m	1.9E-06	7.0E+09	1.4E+05
Sr-89	3.6E-03	1.3E+13	2.7E+08
Sr-90	1.9E-01	7.0E+14	1.4E+10
Sr-91	3.2E-05	1.2E+11	2.4E+06
Sr-92	9.0E-06	3.3E+10	6.8E+05
Ta-172	5.0E-06	1.9E+10	3.8E+05
Ta-173	8.7E-06	3.2E+10	6.5E+05
Ta-174	2.0E-06	7.4E+09	1.5E+05
Ta-175	2.5E-05	9.3E+10	1.9E+06
Ta-176	2.8E-05	1.0E+11	2.1E+06
Ta-177	1.5E-05	5.6E+10	1.1E+06
Ta-178a	9.3E-08	3.4E+08	7.0E+03
Ta-178b	5.0E-06	1.9E+10	3.8E+05
Ta-179	9.2E-04	3.4E+12	6.9E+07
Ta-180	1.5E-01	5.6E+14	1.1E+10
Ta-180m	1.0E-06	3.7E+09	7.5E+04
Ta-182	6.0E-03	2.2E+13	4.5E+08
Ta-182m	9.2E-07	3.4E+09	6.9E+04
Ta-183	3.0E-04	1.1E+12	2.3E+07
Ta-184	2.8E-05	1.0E+11	2.1E+06
Ta-185	1.3E-06	4.8E+09	9.8E+04
Ta-186	1.6E-06	5.9E+09	1.2E+05
Tb-147	1.2E-05	4.4E+10	9.0E+05
Tb-149	3.4E-05	1.3E+11	2.6E+06
Tb-150	1.1E-05	4.1E+10	8.3E+05
Tb-151	3.3E-05	1.2E+11	2.5E+06
Tb-153	5.3E-05	2.0E+11	4.0E+06
Tb-154	8.5E-05	3.1E+11	6.4E+06
Tb-155	7.0E-05	2.6E+11	5.3E+06

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Tb-156	5.5E-04	2.0E+12	4.1E+07
Tb-156m	1.1E-04	4.1E+11	8.3E+06
Tb-156n	2.2E-05	8.1E+10	1.7E+06
Tb-157	1.1E-03	4.1E+12	8.3E+07
Tb-158	1.8E-01	6.7E+14	1.4E+10
Tb-160	3.9E-03	1.4E+13	2.9E+08
Tb-161	2.0E-04	7.4E+11	1.5E+07
Tc-93	7.3E-06	2.7E+10	5.5E+05
Tc-93m	2.9E-06	1.1E+10	2.2E+05
Tc-94	2.4E-05	8.9E+10	1.8E+06
Tc-94m	4.9E-06	1.8E+10	3.7E+05
Tc-95	2.8E-05	1.0E+11	2.1E+06
Tc-95m	2.1E-03	7.8E+12	1.6E+08
Tc-96	5.4E-04	2.0E+12	4.1E+07
Tc-96m	4.5E-06	1.7E+10	3.4E+05
Tc-97	5.2E-03	1.9E+13	3.9E+08
Tc-97m	7.1E-04	2.6E+12	5.3E+07
Tc-98	4.4E-01	1.6E+15	3.3E+10
Tc-99	3.4E-02	1.3E+14	2.6E+09
Tc-99m	1.6E-06	5.9E+09	1.2E+05
Tc-101	4.5E-07	1.7E+09	3.4E+04
Tc-104	3.0E-06	1.1E+10	2.3E+05
Te-116	9.4E-06	3.5E+10	7.1E+05
Te-121	5.6E-04	2.1E+12	4.2E+07
Te-121m	5.5E-03	2.0E+13	4.1E+08
Te-123	3.2E-03	1.2E+13	2.4E+08
Te-123m	1.6E-03	5.9E+12	1.2E+08
Te-125m	6.9E-04	2.6E+12	5.2E+07
Te-127	1.2E-06	4.4E+09	9.0E+04
Te-127m	1.9E-03	7.0E+12	1.4E+08
Te-129	3.4E-07	1.3E+09	2.6E+04
Te-129m	2.3E-03	8.5E+12	1.7E+08
Te-131	6.3E-05	2.3E+11	4.7E+06
Te-131m	4.2E-03	1.6E+13	3.2E+08
Te-132	7.2E-04	2.7E+12	5.4E+07
Te-133	3.2E-06	1.2E+10	2.4E+05
Te-133m	1.6E-05	5.9E+10	1.2E+06
Te-134	5.2E-06	1.9E+10	3.9E+05
Th-226	6.5E-05	2.4E+11	4.9E+06
Th-227	6.4E-02	2.4E+14	4.8E+09
Th-228	8.0E-01	3.0E+15	6.0E+10
Th-229	3.4E+00	1.3E+16	2.6E+11
Th-230	4.9E-01	1.8E+15	3.7E+10
Th-231	1.1E-05	4.1E+10	8.3E+05
Th-232	2.6E+00	9.6E+15	2.0E+11
Th-234	1.8E-03	6.7E+12	1.4E+08

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
Ti-44	4.5E-01	1.7E+15	3.4E+10
Ti-45	5.5E-06	2.0E+10	4.1E+05
Tl-194	1.6E-06	5.9E+09	1.2E+05
Tl-194m	4.6E-06	1.7E+10	3.5E+05
Tl-195	4.4E-06	1.6E+10	3.3E+05
Tl-197	4.0E-06	1.5E+10	3.0E+05
Tl-198	1.8E-05	6.7E+10	1.4E+06
Tl-198m	7.7E-06	2.9E+10	5.8E+05
Tl-199	3.5E-06	1.3E+10	2.6E+05
Tl-200	5.8E-05	2.1E+11	4.4E+06
Tl-201	2.6E-05	9.6E+10	2.0E+06
Tl-202	5.1E-04	1.9E+12	3.8E+07
Tl-204	1.9E-03	7.0E+12	1.4E+08
Tl-206	4.6E-11	1.7E+05	3.5E+00
Tl-207	1.1E-09	4.1E+06	8.3E+01
Tl-208	9.9E-07	3.7E+09	7.4E+04
Tl-209	3.1E-07	1.1E+09	2.3E+04
Tm-162	2.8E-06	1.0E+10	2.1E+05
Tm-166	2.4E-05	8.9E+10	1.8E+06
Tm-167	2.4E-04	8.9E+11	1.8E+07
Tm-170	1.2E-03	4.4E+12	9.0E+07
Tm-171	1.3E-04	4.8E+11	9.8E+06
Tm-172	2.1E-04	7.8E+11	1.6E+07
Tm-173	7.1E-06	2.6E+10	5.3E+05
Tm-175	1.6E-06	5.9E+09	1.2E+05
U-230	8.3E-02	3.1E+14	6.2E+09
U-231	6.4E-05	2.4E+11	4.8E+06
U-232	1.9E+00	7.0E+15	1.4E+11
U-233	3.2E-01	1.2E+15	2.4E+10
U-234	3.1E-01	1.1E+15	2.3E+10
U-235	3.4E-01	1.3E+15	2.6E+10
U-236	3.0E-01	1.1E+15	2.3E+10
U-237	2.5E-04	9.3E+11	1.9E+07
U-238	2.9E-01	1.1E+15	2.2E+10
U-239	7.0E-07	2.6E+09	5.3E+04
U-240	2.1E-05	7.8E+10	1.6E+06
V-47	2.0E-06	7.4E+09	1.5E+05
V-48	2.8E-03	1.0E+13	2.1E+08
V-49	2.3E-05	8.5E+10	1.7E+06
W-176	8.1E-06	3.0E+10	6.1E+05
W-177	4.9E-06	1.8E+10	3.7E+05
W-178	5.3E-04	2.0E+12	4.0E+07
W-179	1.5E-07	5.6E+08	1.1E+04
W-181	4.4E-04	1.6E+12	3.3E+07
W-185	1.5E-03	5.6E+12	1.1E+08
W-187	3.6E-05	1.3E+11	2.7E+06

Table 1. Results of the Screening Analysis

Radionuclide	Level I Screening Factor ($Sv/Bq-m^{-3}$)	Level I Screening Factor ($mrem/Ci-m^{-3}$)	Screening Dose mrem/yr
W-188	8.0E-03	3.0E+13	6.0E+08
Xe-120	3.4E-06	1.3E+10	2.6E+05
Xe-121	3.5E-06	1.3E+10	2.6E+05
Xe-122	3.1E-05	1.1E+11	2.3E+06
Xe-123	1.8E-06	6.7E+09	1.4E+05
Xe-125	5.8E-04	2.1E+12	4.4E+07
Xe-127	3.3E-07	1.2E+09	2.5E+04
Xe-129m	2.9E-08	1.1E+08	2.2E+03
Xe-131m	1.1E-08	4.1E+07	8.3E+02
Xe-133	4.3E-08	1.6E+08	3.2E+03
Xe-133m	3.7E-08	1.4E+08	2.8E+03
Xe-135	3.0E-07	1.1E+09	2.3E+04
Xe-135m	3.7E-07	1.4E+09	2.8E+04
Xe-138	2.2E-06	8.1E+09	1.7E+05
Y-86	8.7E-05	3.2E+11	6.5E+06
Y-86m	5.1E-06	1.9E+10	3.8E+05
Y-87	1.6E-04	5.9E+11	1.2E+07
Y-88	1.0E-02	3.7E+13	7.5E+08
Y-90	2.8E-04	1.0E+12	2.1E+07
Y-90m	1.8E-05	6.7E+10	1.4E+06
Y-91	1.8E-03	6.7E+12	1.4E+08
Y-91m	2.4E-06	8.9E+09	1.8E+05
Y-92	3.1E-06	1.1E+10	2.3E+05
Y-93	9.5E-06	3.5E+10	7.1E+05
Y-94	1.7E-06	6.3E+09	1.3E+05
Y-95	1.5E-06	5.6E+09	1.1E+05
Yb-162	1.5E-06	5.6E+09	1.1E+05
Yb-166	2.4E-04	8.9E+11	1.8E+07
Yb-167	6.8E-07	2.5E+09	5.1E+04
Yb-169	8.3E-04	3.1E+12	6.2E+07
Yb-175	8.1E-05	3.0E+11	6.1E+06
Yb-177	2.7E-06	1.0E+10	2.0E+05
Yb-178	7.1E-07	2.6E+09	5.3E+04
Zn-62	3.0E-05	1.1E+11	2.3E+06
Zn-63	2.4E-06	8.9E+09	1.8E+05
Zn-65	2.7E-02	1.0E+14	2.0E+09
Zn-69	7.7E-08	2.9E+08	5.8E+03
Zn-69m	1.6E-05	5.9E+10	1.2E+06
Zn-71m	1.2E-05	4.4E+10	9.0E+05
Zn-72	6.1E-04	2.3E+12	4.6E+07
Zr-86	1.1E-04	4.1E+11	8.3E+06
Zr-88	8.7E-03	3.2E+13	6.5E+08
Zr-89	2.2E-04	8.1E+11	1.7E+07
Zr-93	7.4E-04	2.7E+12	5.6E+07
Zr-95	4.1E-03	1.5E+13	3.1E+08
Zr-97	7.2E-05	2.7E+11	5.4E+06

Table 2. Trigger Values

Radionuclide	Trigger Value Ci
Ar-37	7.8E+06
Ar-41	8.9E+00
As-69	7.4E+00
As-70	1.3E+00
As-71	1.2E-01
As-72	1.1E-01
As-73	4.3E-02
As-74	9.5E-03
As-76	2.1E-01
As-77	6.3E-01
As-78	2.8E+00
At-207	8.3E-01
At-211	5.5E-02
At-216	4.3E+06
At-217	4.2E+04
At-218	6.0E+02
Br-74	1.7E+00
Br-74m	1.4E+00
Br-75	1.1E+00
Br-76	1.6E-01
Br-77	2.1E-01
Br-80	8.9E+01
Br-80m	8.3E+00
Br-82	5.8E-02
Br-83	5.5E+01
Br-84	3.7E+00
C-11	8.9E+00
Cl-38	4.0E+00
Cl-39	3.5E+00
F-18	3.2E+00
Ge-66	1.1E+00
Ge-67	6.0E+00
Ge-68	1.0E-03
Ge-69	1.8E-01
Ge-71	1.2E+00
Ge-75	4.9E+01
Ge-77	4.7E-01
Ge-78	3.1E+00
Hg-193	4.3E+00
Hg-193m	4.9E-01
Hg-194	2.8E-05
Hg-195	2.2E+00
Hg-195m	1.9E-01
Hg-197	3.6E-01
Hg-197m	4.4E-01
Hg-199m	2.4E+01

Table 2. Trigger Values

Radionuclide	Trigger Value Ci
Hg-203	7.4E-03
I-120	1.3E+00
I-120m	9.5E-01
I-121	2.6E+00
I-122	4.0E+01
I-123	1.7E+00
I-124	1.6E-03
I-125	2.6E-04
I-126	2.4E-04
I-128	6.0E+01
I-130	1.9E-01
I-131	4.7E-04
I-132	1.1E+00
I-132m	2.1E+00
I-133	6.0E-02
I-134	2.0E+00
I-135	5.3E-01
Kr-74	4.2E+00
Kr-76	2.0E-01
Kr-77	4.9E+00
Kr-79	4.3E+01
Kr-81	1.0E+03
Kr-83m	1.2E+05
Kr-85	4.7E+03
Kr-85m	6.6E+01
Kr-87	1.3E+01
Kr-88	2.5E+00
N-13	1.4E+01
O-15	1.0E+02
P-30	7.0E+01
P-32	1.8E-03
P-33	1.4E-02
Sb-115	7.0E+01
Sb-116	1.8E-03
Sb-116m	1.4E-02
Sb-117	7.0E+01
Sb-118m	1.8E-03
Sb-119	1.4E-02
Sb-120a	7.0E+01
Sb-120b	1.8E-03
Sb-122	1.4E-02
Sb-124m	1.3E+02
Sb-124n	8.3E+00
Sb-126	6.3E-03
Sb-126m	5.1E+00
Sb-127	3.6E-02

Table 2. Trigger Values

Radionuclide	Trigger Value Ci
Sb-128a	6.6E+00
Sb-128b	2.5E-01
Sb-129	8.9E-01
Sb-130	1.9E+00
Sb-131	2.3E-01
Se-70	1.9E+00
Se-73	8.3E-01
Se-73m	8.3E+00
Se-77m	1.9E+04
Se-81	2.3E+02
Se-81m	5.1E+01
Se-83	3.4E+00
Sn-110	1.0E+00
Sn-111	7.8E+00
Sn-117m	2.2E-02
Sn-123m	3.3E+01

Table 2. Trigger Values

Radionuclide	Trigger Value Ci
Sn-125	6.3E-03
Sn-127	7.8E-01
Sn-128	2.1E+00
Xe-120	3.9E+00
Xe-121	3.8E+00
Xe-122	4.3E-01
Xe-123	7.4E+00
Xe-125	2.3E-02
Xe-127	4.0E+01
Xe-129m	4.6E+02
Xe-131m	1.2E+03
Xe-133	3.1E+02
Xe-133m	3.6E+02
Xe-135	4.4E+01
Xe-135m	3.6E+01
Xe-138	6.0E+00

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